Ardea Resources Limited

ASX & Media Release

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ASX Symbol

ARL

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Shares
67,000,747

Unlisted options
12,310,022

Loyalty options
26,436,923

ABN 30 614 289 342

Exceptional acid leach extraction results from the KNP Cobalt Zone

Over 98% extraction of cobalt and nickel at atmospheric conditions, and KNP resource update.

- Initial KNP Cobalt Zone acid leach test work shows exceptional results on Goongarrie South run-of-mine drill core samples:
  - Lab-scale atmospheric hydrochloric acid leach **extracts over 98% of cobalt and nickel**, and **over 92% of scandium**
  - Genuine alternative to the costly High Pressure Acid Leach (HPAL) processing technique.
  - Early stage results, with further testing current.
- Cobalt-based resource upgrades for Scotia Dam and Black Range enter final stage before completion.
- Nickel-based resource update for the entire KNP:
  - **773.0 Mt at 0.05 % cobalt and 0.70 % nickel**[1]
  - **405,000 tonnes contained cobalt**, 5.46 million tonnes contained nickel
  - Further updates expected as remodelling progresses.
- Lewis Ponds metallurgical testing is progressing, showing potential effectiveness of Dense Media Separation. Work is ongoing.

[1] Breakdown for the KNP Resource is as follows. See remainder of document for details

Resource Category	**Quantity** (Mt)	**Cutoff**	**Cobalt** (%)	**Nickel** (%)
Measured	9.6	0.5% Ni	0.10	1.02
Indicated	232.9	0.5% Ni	0.06	0.75
Inferred	530.5	0.5% Ni	0.05	0.68
KNP Total Resources	**773.0**	**0.5% Ni**	**0.05**	**0.70**

Ardea Resources Limited (ASX: ARL, "Ardea" or "the Company") is pleased to announce that ongoing metallurgical test work on the KNP Cobalt Zone and the Lewis Ponds pre-feasibility studies drill results have been received for the recent diamond drilling programs at Goongarrie South (Figure 1) and Lewis Ponds.

At Goongarrie South, high-grade cobalt and nickel mineralisation was confirmed, and the drilling highlighted potentially significant occurrences of scandium. The purpose of these drill holes was to sample mineralisation that is representative of future mining activities. These samples are being used for the metallurgical test work that is a major part of the Pre-Feasibility Study (PFS) for the KNP Cobalt Zone. This test work is now defining the mechanisms for recovering cobalt and nickel from the various deposits that constitute the Cobalt Zone.

KNP Cobalt Zone

Metallurgical test work on the core drilled at Goongarrie South in May this year is proceeding well. Leach test work is ongoing, with metal extractions in excess of 90 % having been recorded for all payable metals, namely cobalt, nickel, and scandium. High purity alumina and chromium extraction for KNP mineralisation is yet to be evaluated.

Acid leach test work

Leach test work has commenced with the focus to prioritise cobalt extraction. Within any cobalt-nickel laterite, there is always a significantly greater volume of nickel compared to cobalt. A characteristic feature of the KNP Cobalt Zone, however, is the unusually high proportion of cobalt to nickel. In most laterite deposits, the ratio of cobalt to nickel varies between 1:12 and 1:20. In the KNP Cobalt Zone, the ratio is less than 1:6. Prioritisation of cobalt dissolution and recovery over that of nickel further enhances this ratio in solution.

To liberate the metals from the goethitic clay that hosts the mineralisation, the material must be dissolved in acid under either atmospheric (or non-pressurised) pressure or high pressure (within an autoclave). There are three dissolution techniques being trialled by Ardea:

1. High pressure acid leach (HPAL) using sulphuric acid as the metal solvent;
2. Sulphuric acid leach at atmospheric pressure; and
3. Hydrochloric acid leach at atmospheric pressure.

Atmospheric leach testing to date is highly promising. At a 1:1 ratio of hydrochloric acid (HCl) to run-of-mine mineralisation, reacting for 24 hours at 70°C, the extraction of **98.7 % of the cobalt**, **98.4 % of the nickel**, and **92.4 % of the scandium** was achieved (Table 1, Figure 2). Even with the reaction time reduced to only 2 hours (other conditions identical), 90.1 % of the cobalt was extracted (see Appendix 1).

Table 1 – Metal extraction for cobalt, iron, nickel, and scandium for run-of-mine material sampled from Goongarrie South using hydrochloric acid under atmospheric conditions. .

Test No.	Acid	Dosage (kg/t)	Time (hrs)	Temp (°C)	Method	Metal Extraction			
						Co (%)	Fe (%)	Ni (%)	Sc (%)
131	HCl	400	24	70	Bottle roll	55.6	29.3	43.6	0.0
132	HCl	600	24	70	Bottle roll	79.2	48.3	63.9	10.5
133	HCl	800	24	70	Bottle roll	**92.3**	80.3	84.9	59.1
134	HCl	1000	24	70	Bottle roll	**98.7**	**92.4**	**98.4**	**92.4**

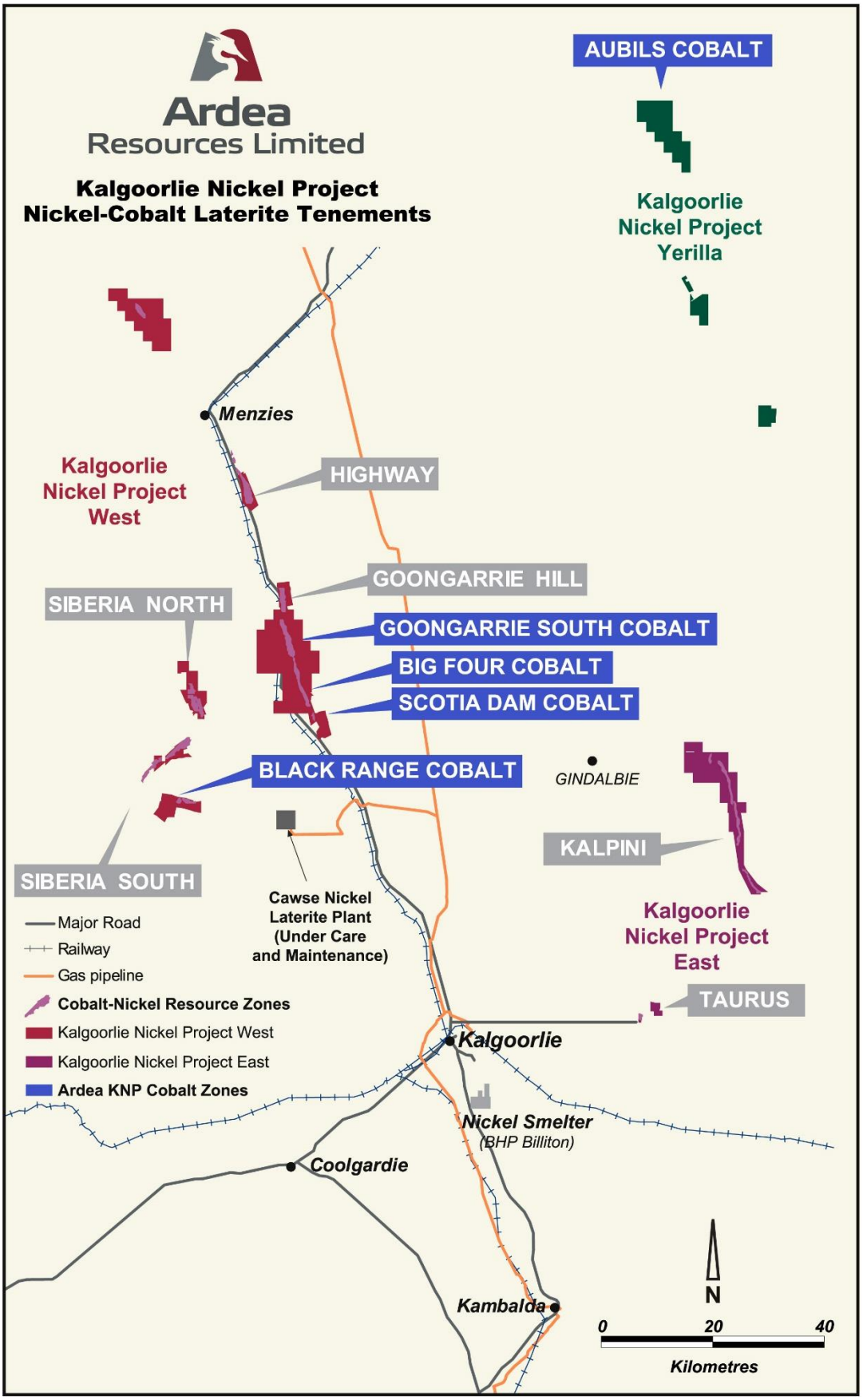

Figure 1 – Location map for the KNP and the KNP Cobalt Zone (blue labels).

Keeping in mind that these are laboratory scale results, these atmospheric acid leach efficiencies exceed those usually associated with HPAL flow sheets. This is extremely encouraging and will require industrial-scale testing at the Bankable Feasibility Study stage. HPAL tests will continue to be undertaken for direct comparison to historic test work and to ensure that all appropriate options are assessed.

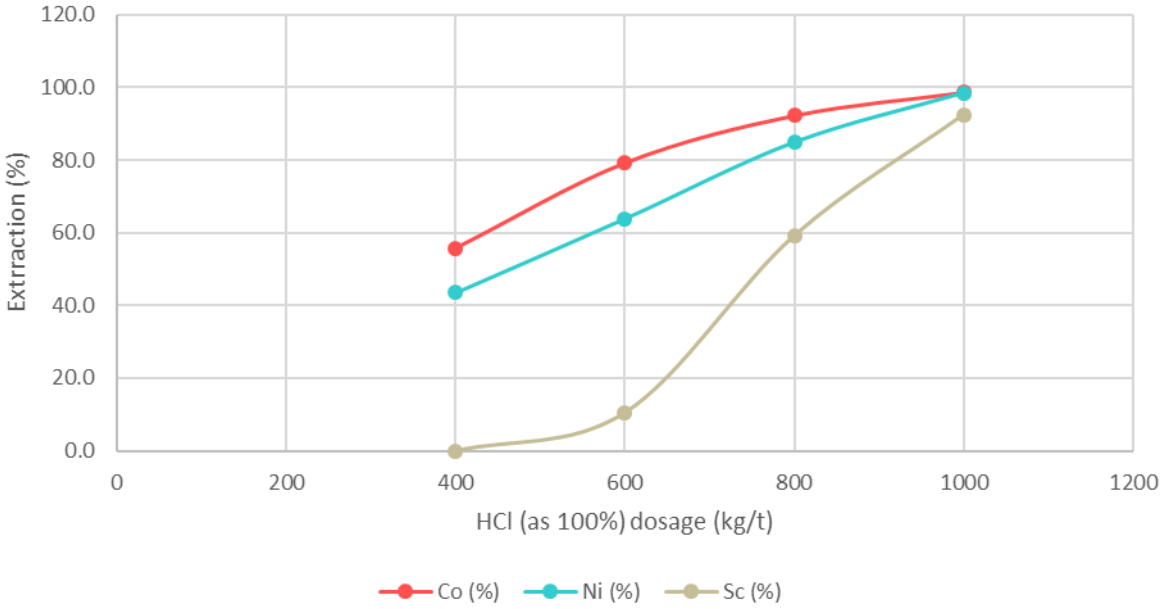

Figure 2 – Percentage extraction of metals versus hydrochloric acid dosage (under atmospheric conditions at 70°C for 24 hours).

In these initial tests by Ardea, hydrochloric acid digestion is proving superior to sulphuric acid digestion despite the hydrochloric leach tests being undertaken at 10–15°C cooler temperatures. Leach test work is still underway, with kinetic tests expected to be completed this week. Kinetic tests check the effects of variable leach times (e.g. 6, 12, 24, and 48 hours) under constant conditions.

The early success of the hydrochloric acid leach is important for a number of reasons, including:

- The atmospheric hydrochloric leach preferentially favours cobalt over nickel dissolution, thus enhancing the proportion of cobalt in the solute.
- Although costs for any type of plant are yet to be determined for the KNP Cobalt Zone, in general atmospheric leach plants are less expensive than HPAL plants.

The PFS assumes the use of a patented acid recovery system developed by Simulus Engineers that results in optimised acid consumption. This has the twin effects of lower operating costs and low environmental risk of acid leaching from waste products.

Forthcoming PFS work

The timeline for the next couple of months is as follows:

Activity	Duration	Expected completion date
Completion of initial leach optimisation tests	2 weeks	mid-August
Sample variability response tests	2 weeks	late August
Leach selection study	4 weeks	late September
Completion of PFS study		End December 2017
Release of PFS report		Q1 2018

Cobalt resource remodelling and upgrades

Work continues on the definition of cobalt-based remodelling of the KNP Cobalt Zone. Work is nearing completion on several areas, with pit shell modelling left to be completed at both Scotia Dam and Black Range.

Goongarrie cobalt-nickel camp

The Goongarrie cobalt-nickel camp comprises a near-continuous series of deposits over around 20 km strike length. From north to south, the Goongarrie camp comprises Goongarrie Hill, Goongarrie South, Big Four, and Scotia Dam. Resources have been remodelled at Goongarrie South and Big Four, with substantial upgrades to the cobalt resources.

At Scotia Dam, cobalt grade shell definition shows extensive cobalt mineralisation that will augment the Goongarrie South and Big Four resources. Scotia Dam is contiguous with Big Four and covers around 1 km strike at the southern end of the Goongarrie camp.

At Goongarrie Hill, appraisal of the data shows that, despite significant nickel mineralisation, cobalt grades are not contiguous at 0.10 %. Goongarrie Hill is a relatively small deposit, covering around 4 km at the northern end of the Goongarrie camp. As a result of this reappraisal, Goongarrie Hill will not be incorporated into the KNP Cobalt Zone.

Black Range deposit

Modelling at Black Range is also nearing completion. Extensive cobalt-nickel mineralisation stretches over 3.6 km to the southwest of the Goongarrie camp. With a more comprehensive suite of elements analysed, the deposit is being assessed for nickel, cobalt, scandium, and platinoids. The mineralisation is open to the west on tenure where Ardea has entitlement to cobalt-nickel rights.

The nickel-based model appears to confirm earlier resource estimates. The cobalt-based model is a subset of the nickel model, similar to the relationship between calculated nickel intercepts and cobalt intercepts from the KNP Cobalt Zone.

Revision of the nickel resource

With remodelling of the cobalt resources, revision of the nickel-based resource for the KNP has also been undertaken. Unlike the Cobalt Zone resource which is based on a series of cobalt cut-offs, the overall KNP resource is based on a 0.5 % nickel cut-off. Based on the updated work at Goongarrie South and Big Four deposits, the overall KNP resource is **773.0 Mt at 0.05 % cobalt and 0.70 % nickel**. The breakdown is as follows:

Table 2 – Updated resource for the KNP based on a 0.5 % nickel cut-off. Note that all values have been rounded appropriate to their deemed accuracy, so totalling values may not appear accurate. See Table 3 (overleaf) for the resource breakdown.

Resource Category	Quantity (Mt)	Cobalt (%)	Nickel (%)	Contained cobalt (t)	Contained nickel (t)
Measured	9.6	0.10	1.02	9,700	98,800
Indicated	232.9	0.06	0.75	141,200	1,759,700
Inferred	530.5	0.05	0.68	254,400	3,600,000
KNP Total Resources	**773.0**	**0.05**	**0.70**	**405,400**	**5,458,400**

Of particularly note is that, despite the lower tonnages that the previous estimate, the total contained cobalt metal tonnages have increased to over 400,000 t, a 3.5 % increase based on work on these two deposits

only. It should also be noted the tenements of the KNP Cobalt Zone are not part of any joint venture arrangement. All tenements within the KNP Cobalt Zone are 100 % owned by Ardea, and the majority are active, granted mining licences.

Table 3 – Resource breakdown of the overall KNP resource, based on a nickel cut-off of 0.5 %. Note that all values have been rounded appropriate to their deemed accuracy, so totalling values may not appear accurate.

Region	Camp	Prospect	Resource category	Size (Mt)	Nickel (%)	Cobalt (%)	Contained nickel (t)	Contained cobalt (t)	Estimation method	Estimate source	Study period	Note
KNP West	**Goongarrie**	Goongarrie South	Measured	5.8	1.08	0.14	62,900	7,900	Krige	HGMC	2017 PFS	
			Indicated	51.4	0.78	0.08	403,800	42,800	Krige	HGMC	2017 PFS	
			Inferred	25.8	0.63	0.07	161,500	17,500	Krige	HGMC	2017 PFS	
		Highway	Indicated	52.9	0.66	0.04	349,100	22,200	Krige	Heron	Post 2010 PFS	
			Inferred	34.1	0.64	0.04	218,100	12,900	Krige	Heron	Post 2010 PFS	
		Ghost Rocks	Inferred	47.3	0.66	0.04	312,900	19,900	Krige	Heron	Post 2010 PFS	
		Goongarrie Hill	Inferred	53.6	0.60	0.04	323,700	19,800	Krige	Heron	Post 2010 PFS	Remodelling underway
		Big Four	Indicated	34.2	0.71	0.08	241,700	28,700	Krige	HGMC	2017 PFS	
			Inferred	7.6	0.61	0.09	46,700	6,800	Krige	HGMC	2017 PFS	
		Scotia	Inferred	11.2	0.77	0.08	86,200	9,000	Krige	Snowden	Pre 2010 PFS	Remodelling underway
		Goongarrie subtotal	*Measured*	*5.8*	*1.08*	*0.14*	*62,900*	*7,900*				
			Indicated	*138.5*	*0.72*	*0.07*	*994,600*	*93,700*				
			Inferred	*179.6*	*0.64*	*0.05*	*1,149,200*	*85,900*				
	Siberia	Siberia South	Inferred	96.5	0.65	0.03	631,100	33,200	Krige	Snowden	Pre 2010 PFS	M24/846 resource removed
		Siberia North	Indicated	10.0	0.64	0.05	64,000	5,100	Krige	Snowden	Post 2010 PFS	
		Siberia North	Inferred	53.3	0.65	0.04	349,000	23,100	Krige	Snowden	Post 2010 PFS	
		Black Range	Inferred	20.1	0.75	0.10	149,000	20,000	Krige	Snowden	Pre 2010 PFS	Remodelling underway
		Siberia subtotal	*Indicated*	*10.0*	*0.64*	*0.05*	*64,000*	*5,100*				
			Inferred	*170.0*	*0.67*	*0.05*	*1,130,800*	*77,000*				
			Measured	5.8	1.08	0.14	62,900	7,900				
			Indicated	148.5	0.71	0.07	1,058,600	98,800				
			Inferred	349.5	0.65	0.05	2,280,000	162,900				
KNP East	**Bulong**	Taurus	Inferred	14.2	0.84	0.05	119,000	7,300	Krige	Snowden	Pre 2010 PFS	
		Bulong East	Indicated	15.9	1.06	0.06	168,000	8,800	Krige	Snowden	Pre 2010 PFS	
			Inferred	24.0	0.79	0.05	189,100	12,700	Krige	Snowden	Pre 2010 PFS	
		Bulong subtotal	*Indicated*	*15.9*	*1.06*	*0.06*	*168,000*	*8,800*				
			Inferred	*38.2*	*0.81*	*0.05*	*308,100*	*20,000*				
	Hampton	Kalpini	Inferred	75.0	0.73	0.04	549,700	32,600	Krige	Snowden	Pre 2010 PFS	
		Hampton subtotal	*Inferred*	*75.0*	*0.73*	*0.04*	*549,700*	*32,600*				
			Indicated	15.9	1.06	0.06	168,000	8,800				
			Inferred	113.2	0.76	0.05	857,800	52,700				
KNP Yerilla	**Yerilla**	Jump Up Dam	Measured	3.8	0.94	0.05	35,900	1,800	Krige	Snowden	2009 PFS	
			Indicated	41.6	0.78	0.04	326,700	18,000	Krige	Snowden	2009 PFS	
			Inferred	18.4	0.63	0.03	116,400	6,300	Krige	Snowden	2009 PFS	
		Boyce Creek	Indicated	26.8	0.77	0.06	206,400	15,500	Krige	Heron	2009 PFS	
		Aubils	Inferred	49.4	0.70	0.07	345,800	32,600	Krige	Heron	2009 PFS	
			Measured	3.8	0.94	0.05	35,900	1,800				
			Indicated	68.4	0.78	0.05	533,000	33,500				
			Inferred	67.8	0.68	0.06	462,200	38,900				
KNP Overall Resource			**Measured**	**9.6**	**1.03**	**0.10**	**98,800**	**9,700**				
			Indicated	**232.9**	**0.76**	**0.06**	**1,759,700**	**141,200**				
			Inferred	**530.5**	**0.68**	**0.05**	**3,600,000**	**254,400**				
GRAND TOTAL			Global	773.0	0.71	0.05	5,458,400	405,400				

It is expected that, as the Scotia Dam and Black Range cobalt-based resources are updated, so will the associated nickel-based resource, and this overall KNP resource will also be updated.

The resulting changes to the resource enhance the KNP's position as the largest cobalt project in Australia by contained metal. Additionally, the recent upgrade of the KNP Cobalt Zone resource means that it is now Australia's fourth largest behind the KNP full nickel resource, Murrin Murrin, and Syerston. It is also the highest grade of the significant large deposits.

Rank	Company	Project	Size (Mt)	Cobalt grade (%)	Contained cobalt metal (kt)	Mineralisation style
1	Ardea	KNP, WA (*including KNP Cobalt Zone*)	773	0.05	405	Lateritic Ni-Co
2	Glencore	Murrin Murrin, WA	533	0.07	364	Lateritic Ni-Co
3	CleanTeq	Syerston, NSW	109	0.10	114	Lateritic Ni-Co-Sc
4	Ardea	KNP Cobalt Zone, WA	66	0.13	83	Lateritic Ni-Co-Sc
5	GME	NiWest, WA	81	0.06	52	Lateritic Ni-Co

Notes:

1. *KNP resource, source: this document.*
2. *Murrin Murrin resource, source: Glencore 2016 Annual Report*
3. *Syerston resource, source: "Syerston Project Geology and Resource", www.cleanteq.com*
4. *KNP Cobalt Zone resource, source: "Substantial increase in KNP Cobalt Zone resource", Ardea Resources, 28/06/2017*
5. *NiWest resource, source: "NiWest Nickel-Cobalt Resource", GME Resources, 21/02/2017*

Lewis Ponds

Metallurgical test work is underway on mineralised stringer zone drill core sampled from recent drilling at Lewis Ponds. The work aims to define a process stream that will upgrade the plant-feed metals within the stringer zone mineralisation from a bulk mining operation.

Primary composite test work is underway, showing good pre-concentration potential, but is in very eary stages. We will update shareholders as more data becomes available.

Forthcoming work

Following continued successful test work results from the initial primary composite, work will be expanded to cover additional composite samples to assess ore variability. This will be followed by comminution testwork.

The scheduled Lewis Ponds PFS timeline is as follows:

Activity	Duration	Expected completion date
Completion of initial primary composite tests	6 weeks	mid-September
Variability tests	4 weeks	mid-October
Comminution tests	4 weeks	mid-November
Process Plant PFS design and capital estimate		End December 2017
Release of PFS report		Q1 2018

For further information regarding Ardea, please visit www.ardearesources.com.au or contact:

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About Ardea Resources

Ardea Resources Limited (ASX: ARL) is a Western Australia-based resources company focused on developing the KNP Cobalt Zone, the richest part of the largest cobalt resource in the developed world. The Company has a high-quality suite of development and exploration assets, including the advanced-stage cobalt-nickel KNP Project near Kalgoorlie in Western Australia, the Lewis Ponds zinc-gold project in New South Wales, and a series of Australian gold and base metal deposits. Ardea Resources is focused on becoming a reliable and ethical producer of cobalt for the booming battery industry, whose growth is driven by the automotive electrification revolution as the world shifts towards zero emissions vehicles.

Compliance Statement (JORC 2012)

A competent person's statement for the purposes of Listing Rule 5.22 has previously been announced by the Company for:

1. *Kalgoorlie Nickel Project on 21 October 2013 and 31 June 2014, October 2016, 2016 Heron Resources Annual Report and 6 January 2017;*
2. *KNP Cobalt Zone Study on 6 January 2017*

The Company confirms that it is not aware of any new information or data that materially affects information included in previous announcements, and all material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed. All projects will be subject to new work programs following the listing of Ardea, notably drilling, metallurgy and JORC Code 2012 resource estimation as applicable.

The information in this report that relates to the Black Range Exploration Results is based on information originally compiled by current full-time employees of Ardea Resources Limited. The Exploration Results and data collection processes have been reviewed, verified and re-interpreted by Mr Ian Buchhorn who is a Member of the Australasian Institute of Mining and Metallurgy and a director of Ardea Resources Limited. Mr Buchhorn has sufficient experience that is relevant to the style of mineralization and type of deposit under consideration and to the exploration activities undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mr Buchhorn consents to the inclusion in this report of the matters based on his information in the form and context that it appears.

The exploration and industry benchmarking summaries are based on information reviewed by Dr Matthew Painter, who is a Member of the Australian Institute of Geoscientists. Dr Painter is a full-time employee and a director of Ardea Resources Limited and has sufficient experience, which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr Painter has reviewed this press release and consents to the inclusion in this report of the information in the form and context in which it appears.

CAUTIONARY NOTE REGARDING FORWARD-LOOKING INFORMATION

This news release contains forward-looking statements and forward-looking information within the meaning of applicable Australian securities laws, which are based on expectations, estimates and projections as of the date of this news release.

This forward-looking information includes, or may be based upon, without limitation, estimates, forecasts and statements as to management's expectations with respect to, among other things, development and business plans, capital and exploration expenditures, the

effect on the Company of any changes to existing legislation or policy, government regulation of mining operations, the length of time required to obtain permits, certifications and approvals, the success of exploration, development and mining activities, the geology of the Company's properties, environmental risks, the availability of labour, the focus of the Company in the future, demand and market outlook for metals and the prices thereof, progress in development of mineral properties, the Company's ability to raise funding privately or on a public market in the future, the Company's future growth, results of operations, performance, and business prospects and opportunities. Wherever possible, words such as "anticipate", "believe", "expect", "intend", "may" and similar expressions have been used to identify such forward-looking information. Forward-looking information is based on the opinions and estimates of management at the date the information is given, and on information available to management at such time. Forward-looking information involves significant risks, uncertainties, assumptions and other factors that could cause actual results, performance or achievements to differ materially from the results discussed or implied in the forward-looking information. These factors, including, but not limited to, fluctuations in currency markets, fluctuations in commodity prices, the ability of the Company to access sufficient capital on favourable terms or at all, changes in national and local government legislation, taxation, controls, regulations, political or economic developments in Australia or other countries in which the Company does business or may carry on business in the future, operational or technical difficulties in connection with exploration or development activities, employee relations, the speculative nature of mineral exploration and development, obtaining necessary licenses and permits, diminishing quantities and grades of mineral reserves, contests over title to properties, especially title to undeveloped properties, the inherent risks involved in the exploration and development of mineral properties, the uncertainties involved in interpreting drill results and other geological data, environmental hazards, industrial accidents, unusual or unexpected formations, pressures, cave-ins and flooding, limitations of insurance coverage and the possibility of project cost overruns or unanticipated costs and expenses, and should be considered carefully. Many of these uncertainties and contingencies can affect the Company's actual results and could cause actual results to differ materially from those expressed or implied in any forward-looking statements made by, or on behalf of, the Company. Prospective investors should not place undue reliance on any forward-looking information.

Although the forward-looking information contained in this news release is based upon what management believes, or believed at the time, to be reasonable assumptions, the Company cannot assure prospective purchasers that actual results will be consistent with such forward-looking information, as there may be other factors that cause results not to be as anticipated, estimated or intended, and neither the Company nor any other person assumes responsibility for the accuracy and completeness of any such forward-looking information. The Company does not undertake, and assumes no obligation, to update or revise any such forward-looking statements or forward-looking information contained herein to reflect new events or circumstances, except as may be required by law.

No stock exchange, regulation services provider, securities commission or other regulatory authority has approved or disapproved the information contained in this news release.

Appendix 1 – KNP Cobalt Zone Leach test results

Test No.	Acid	Dosage (kg/t)	Time (hrs)	Temp (°C)	Method	Metal Extraction (S & L basis) Co (%)	Fe (%)	Ni (%)	Sc (%)	Free Acid (g/L)	Comments
131	HCl	400	24	70	Bottle roll	55.6	29.3	43.6	0.0	3.6	
132	HCl	600	24	70	Bottle roll	79.2	48.3	63.9	10.5	14.6	
133	HCl	800	24	70	Bottle roll	92.3	80.3	84.9	59.1	21.9	
134	HCl	1000	24	70	Bottle roll	98.7	92.4	98.4	92.4	32.8	
135	H2SO4	600	24	90	Shaker	5.9	1.6	3.0	0.0	220.7	
136	H2SO4	800	24	90	Shaker	8.7	2.9	4.7	0.0	304.0	
137	H2SO4	1000	24	90	Shaker	17.0	7.1	9.5	0.0	382.5	
138	H2SO4	1200	24	90	Shaker	28.5	14.1	18.9	0.0	402.1	
139	HCl	400	2	70	Bottle roll	38.8	17.7	24.2	0.0	91.2	
140	HCl	600	2	70	Bottle roll	62.8	29.9	44.4	0.0	71.8	
141	HCl	800	2	70	Bottle roll	80.7	43.0	62.3	26.1	80.2	
142	HCl	1000	2	70	Bottle roll	90.1	54.4	75.3	39.1	102.1	
143	H2SO4	600	24	85	Bottle roll	33.4	34.2	45.5	10.6	0.0	
144	H2SO4	800	24	85	Bottle roll	44.0	44.5	64.9	48.7	0.0	
145	H2SO4	1000	24	85	Bottle roll	57.0	74.0	79.5	73.2	0.0	
146	H2SO4	1200	24	85	Bottle roll	75.8	85.7	91.7	91.5	0.0	
147	HCl	tba	6	70	Bottle roll						Start tests 27/07
148	HCl	tba	12	70	Bottle roll						Start tests 27/07
149	HCl	tba	24	70	Bottle roll						Start tests 27/07
150	HCl	tba	48	70	Bottle roll						Start tests 27/07
151	H2SO4	tba	6	85	Bottle roll						Start tests 27/07
152	H2SO4	tba	12	85	Bottle roll						Start tests 27/07
153	H2SO4	tba	24	85	Bottle roll						Start tests 27/07
154	H2SO4	tba	48	85	Bottle roll						Start tests 27/07

Appendix 4 – JORC Code, 2012 Edition, Table 1 report

Section 1 Sampling Techniques and Data

(Criteria in this section applies to all succeeding sections)

Criteria	JORC Code explanation	Commentary
Sampling techniques *Note: Due to the similarity of the deposit styles, procedures and estimations used this table represents the combined methods for all Ardea Resources (ARL) Cobalt and Nickel Laterite Resources. Where data not collected by ARL has been used in the resource calculations, variances in techniques are noted.*	• *Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisation that are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.*	• All holes were sampled "in-principle" on a 2 metre down hole interval basis, with exceptions being made due to visual geological/mineralogical breaks, and end of hole final-lengths. All sampling lengths were recorded in ARL's standard core-sampling record spreadsheets. Sample condition, sample recovery and sample size were recorded for all drill-core samples collected by ARL. • The drill spacing was designed to augment historic drilling, provide sufficient material for the purpose of metallurgical sampling, and to undertake twin-hole geochemical reconciliation data between diamond and historic RC drilling. • Industry standard practice was used in the processing of samples for assay, with 2m intervals of quarter core obtained from standard non-oriented HQ3 (63.5mm diameter) core, and submitted in tied calico bags to ALS laboratories. As the drilling was within a 2012 JORC-compliant Indicated Ni-Co resource, prior knowledge of the resource peculiarities contributes and assists significantly to current interpretation of mineralisation. • Assay of samples utilised standard laboratory techniques with standard ICP-AES undertaken on 50 gram samples for Au, Pt and Pd, and lithium borate fused-bead XRF analysis used for the remaining multi-element suite. Further details of lab processing techniques are found in ***Quality of assay data and laboratory tests*** below. • Metallurgical sampling at the Simulus Engineers testing facility was completed by the project geologist and metallurgist by sampling the half HQ drill core in intervals corresponding to the original assay intervals. The core was jaw crushed and multiple riffle split to generate material for metallurgical bulk samples/
Drilling techniques	• *Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (e.g. core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• In this most recent program, Ardea drilled the Goongarrie South deposit with 4 diamond drill holes on a (Mga94 z51) northing grid-spacing of 200m, beginning at 669600N, and ending at the southern-most hole on 6669000N. Holes were vertical (-90 degree dip), designed to optimally intersect the sub-horizontal mineralisation. Industry standard practice was used in drilling, utilising standard non-oriented HQ3 core. Extremely slow drilling rates were used in order maximise recovery in wet clays.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• Diamond drill hole sample percent recovery was initially (day by day) recorded by comparing the measured recovered length of core against the recorded drill-rod depth. On hole-completion, the final length of measured core on a hole by hole basis was recorded against the recorded drill-steel lengths to determine overall core loss, as core lost on one rod run, was sometimes recovered on the next run due to core not "breaking" at end of hole but slightly higher up. Holes were marked up on a measured basis rather than by drill-steel length as this was considered the most accurate mark-up technique, with adjustments made as appropriate in areas that it was visually apparent core had been loss due to excess

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		water from drilling. Overall estimated recovery was approximately 93%, which is considered to be acceptable for nickel-cobalt laterite deposits. Recovery was calculated by dividing the core lost by the total stated core drilled (calculated by drill-steel length sum) and subtracting that percentage total from 100%. Diamond core condition was recorded using a four-code system, DR=Dry, DA=Damp, W=Wet, SA=Saturated. The majority of samples were damp, with a few dry samples recorded. • Measures taken to ensure maximum core recoveries included slow drilling and use of a diverse range of muds (ground-condition appropriate), as well as regular reciprocal communication with the drillers when variable to poor ground conditions were encountered. • There does not appear to be any statistically significant bias in grades due to sample recovery, particularly given the high percentage recovery.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• Drilling was undertaken for metallurgical purposes, and twinning comparison with previous historic RC holes. The level of logging detail utilised supports this type of review and was as follows: Visual geological logging was completed for all drilling both at the time of drilling (using standard Ardea laterite logging codes), and later over relevant met-sample intervals with a metallurgical-logging perspective. Geochemistry from historic data was used together with logging data to validate logged geological horizons. Nickel laterite profiles contain geochemically very distinct horizons and represent a sound validation tool against visual logging. The major part of the logging system was developed by Heron Resources Limited specifically for the KNP and was designed to facilitate future geo-metallurgical studies. It has been customised by Ardea Resources Limited as considered appropriate for recent developments. Planned drill hole target lengths were adjusted by the geologist during drilling. The geologist also oversaw all sampling and drilling practices. A mixture of ARL employees and contract geologists supervised all drilling. Quarter core of all drilling has been retained for reference. • The geological legend used by ARL is a qualitative legend designed to capture the key physical, geological and metallurgical features of the nickel-cobalt laterite mineralisation. Logging captured the colour, regolith unit and mineralisation style, often accompanied by the logging of protolith, estimated percentage of free silica, texture, grain size and alteration. Logging correlated well with the geochemical algorithm developed by Heron Resources Limited for the Yerilla Nickel Project for material type prediction from multi-element assay data. • Once multi-element assays were to hand, the core was geo-metallurgically logged, aiming to quantify mining, hydrometallurgical and environmental attributes of the core. Data was compiled in a DataShed data base.
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being*	• Core was 100% quarter-core sampled for geochemical analysis, and selected half-core was sampled for metallurgical test work. Remaining quarter core has been retained for reference. Core was sawn using a brick saw where competent, and cut with suitably sharp knife/spatula where ductile clays were of sufficient softness. Where friable material existed a visual best-estimate of ¼ of the core along the relevant length was selected. The soft-clay component constituted >90% of core-cutting material. • Quarter-core and half-core sampling is standard industry techniques used for varieties of analyses. Quarter-core was considered appropriate for assay in this case due to the general homogeneity of the orebody and an abundance of historical drill-hole comparison data which can be used for confirmation in this regard. Half core was of sufficient size to obtain the appropriate amount of sample material suitable for metallurgical test work. • QAQC was employed. A standard, or blank was inserted into the sample stream 10 metres on a rotating

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	sampled.	basis. Standards were quantified industry standards. • Utilising previous and current knowledge of the orebody as well as the scale of mining which would be under consideration, 2m intervals generally were deemed an appropriate level of detail for metallurgy related studies. • Quarter core at a nominal 2m interval has been sampled for SG determination. • Quarter core remains as a geological reference set.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.*	• All Ardea samples were submitted to Kalgoorlie ALS laboratories and transported to ALS Perth, where they were pulverised. Analysis at ALS Perth was by ICP utilising a 50g charge (lab method PGM-ICP24) for PGM suite elements (Au, Pt, Pd). Additional analysis was undertaken by sending subsamples to ALS Brisbane where analysis by silicate fusion / XRF analysis (lab method ME-XRF12n) for multiple grade attributes for laterite ores (Al_2O_3, As, BaO, CaO, Cl, Co, Cr_2O_3, Cu, Fe_2O_3, Ga, K_2O, MgO, MnO, Na_2O, Ni, P_2O_5, Pb, Sc, SiO_2, SO_3, SrO, TiO_2, V_2O_5, Zn, ZrO_2). Fusion / XRF analysis is an industry standard method used to analyse nickel laterite ores and ALS is a reputable commercial laboratory with extensive experience in assaying nickel laterite samples from numerous Western Australian nickel laterite deposits. • ALS routinely inserts analytical blanks, standards and duplicates into the client sample batches for laboratory QAQC performance monitoring. • Ardea also inserted QAQC samples into the sample stream at a 1 in 10 frequency, alternating between blanks (industrial sands) and standard reference materials. Additionally, a review was conducted for geochemical consistency between historically expected data, recent data, and geochemical values that would be expected in a nickel laterite profile. • All of the QAQC data has been statistically assessed. There were rare but explainable inconsistencies in the returning results from standards submitted, and it has been determined that levels of accuracy and precision relating to the samples are acceptable.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• Independent verification is currently at a third party laboratory. • All Ardea directors have reviewed the drill core and assessment program • A review of logged geology and geochemical domains within drill holes reconciles consistently with values that would be expected within the lateritic profiles of both areas. Data values are within the numerical ranges that are consistent with proximal drill hole values for the respective orebodies (i.e. values are not considered outliers or skewed). It should be noted that individual grade variations appear more extreme within RC drilling, however overall average grades are consistent and in this regard, there are no apparent aberrant or material grade differences between drill holes. • No adjustments have been made to the assay data.
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• All drill holes surveyed using an RTK DGPS system with either a 3 or 7 digit accuracy. The coordinates are stored in the exploration database referenced to the MGA Zone 51 Datum GDA94. • All holes drilled as part of the Goongarrie South program were vertical. No holes were down-hole surveyed except at EOH. The sub-horizontal orientation of the mineralisation, combined with the soft nature of host material resulted in minimal deviation of vertical diamond drill holes. • The grid system for all models is GDA94. Where historic data or mine grid data has been used it has been transformed into GDA94 from its original source grid via the appropriate transformation. Both original and transformed data is stored in the digital database. • A DGPS pickup up of drill collar locations is considered is considered sufficiently accurate for reporting of

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		resources, but is not suitable for mine planning and reserves.
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• This drill program at Goongarrie South was drilled at a grid spacing of 200mN. • Given the homogeneity of this style of orebody, the spacing is, for bulk-scale metallurgical work and probable mining techniques, considered sufficient. • Sample compositing has not been applied to the newly collected data.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• All drill holes in this program were vertical and give a true width of the regolith layers and mineralisation within the modelled resource. • On a local scale, there is some geological variability in the northern most drill line (6669600mN) due to a probable shear structure. However, this local variability is not considered to be significant for the project overall, but will have local effects on mining and scheduling later in the project life. As the detailed shape of the orebody has already been well defined by an abundance of nearby resource drill holes (including the northern section) it is no bias is expected to be introduced from data pertaining to these drill holes with reference to mineralised structures.
Sample security	• *The measures taken to ensure sample security.*	• All samples were collected and accounted for by ARL employees/consultants during drilling. All samples were bagged into calico plastic bags and closed with cable ties. Samples were transported to Kalgoorlie from logging site by ARL employees/ consultants and submitted directly to ALS Kalgoorlie. • The appropriate manifest of sample numbers and a sample submission form containing laboratory instructions were submitted to the laboratory. Any discrepancies between sample submissions and samples received were routinely followed up and accounted for. • Core is currently stored at Simulus Engineers, for assessment as required in the PFS program.

Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• ARL has periodically conducted internal reviews of sampling techniques relating to resultant exploration datasets, and larger scale reviews capturing the data from multiple drilling programmes within the KNP.
		• Internal reviews of the exploration data included the following:
		  • Unsurveyed drill hole collars (less than 1% of collars).
		  • Drill Holes with overlapping intervals (0%).
		  • Drill Holes with no logging data (less than 2% of holes).
		  • Sample logging intervals beyond end of hole depths (0%).
		  • Samples with no assay data (from 0 to <5% for any given project, usually
		• related to issues with sample recovery from difficult ground conditions,
		• mechanical issues with drill rig, damage to sample in transport or sample preparation).
		  • Assay grade ranges.
		  • Collar coordinate ranges
		  • Valid hole orientation data.
		• The ALS Laboratory was visited by ARL staff in 2016, and the laboratory processes and procedures were reviewed at this time and determined to be robust.